

REMARKS

This amendment is in response to the final Office Action dated October 23, 2002 (Paper No. 9).

Independent Claim 1 has been amended to incorporate the limitations recited in dependent Claims 2-4, which have been canceled. The term "stable" has been added to Claims 1, 9, 26, 56 and 58 to conform to the wording employed in Claim 58. Independent Claim 9 has been amended to incorporate the limitations recited in dependent Claims 10-11, which have been canceled. Independent Claim 26 has been amended to incorporate the limitations recited in dependent Claims 27-28, which have been canceled. Independent Claims 56 and 57 have been amended to incorporate the limitations recited in dependent Claims 3-4, thus Claims 56 and 57 have been amended in a way that is analogous to Claim 1. Independent Claim 58 has been amended to incorporate the limitations recited in dependent Claims 59-60, which have been canceled.

Thus, the presently pending claims are Claims 1, 5-9, 12-26, 29-35, 56-58, and 61-69.

The Present Invention

As recited in amended Claim 1, the present invention is a starch particle having a cationic polyquaternary amine additive adhered to the starch particle, thereby making a starch particle having a stable positive surface charge. Although the invention is simple to describe, nevertheless it is not taught or suggested by the prior art of record. The prior art of record does not teach or suggest a starch particle having a cationic polyquaternary amine additive adhered to the starch particle, thereby making a starch particle having a stable positive surface charge.

As described in the Inventor's Declaration Pursuant To 37 CFR 1.132 by Sherry L. Thomson dated May 20, 2002 (copy attached), the modified starch particles that are representative of the present invention exhibit stable positive charges whereas the flocculated

starches representative of the teachings of Example 3 in Pruszynski exhibit unstable charges. In addition, the charged modified starch particles representative of the present invention are considerably smaller in size than the flocculated starch particles representative of the teachings of Example 3 in Pruszynski. Furthermore, the modified starch particles that are representative of the present invention, with their stable positive charge and smaller particle size, allow addition of the modified starch particles into a normal papermaking system that uses normal retention aid strategies. Finally, qualitative observation of the differences between flocculant treated starch and the treatment in the present invention further substantiates that flocculant treatment forms large uncharged agglomerates whereas the present invention forms small charged particles. When considering the differences of particle size and charge, it is apparent that flocculant treated starch relies only on a mechanical filtration mechanism of retention in papermaking. In contrast, the retention mechanism in papermaking with the present invention relies upon a charge mechanism of retention.

The Rejection of Claims 1, 2, 8-10, 26, 27, and 35

Claims 1, 2, 8-10, 26, 27, and 35 were rejected under 35 U.S.C. §102(b) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious in view of Brucato (U.S. Patent No. 4,609,432), Pruszynski (U.S. Patent No. 5,942,087), or Greenwood (U.S. Patent No. 6,238,520). Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Brucato (U.S. Patent No. 4,609,432)

The Abstract of Brucato teaches that the tearing strength of paper is improved by providing a furnish in which the fiber content is predominantly refined fiber with a minor amount, preferably 2 to 10 wt. %, of added unrefined fiber having incorporated therein a heat activatable bonding agent, particularly starch. The bonding agent adheres to and coats the added

fiber without chemically reacting with the fiber. A cationic material, particularly polyethyleneimine, is premixed with the raw starch to cause it to adhere to the added fiber. During heat drying of the formed paper the starch is gelatinized to effect enhanced bonding of the added fiber.

Brucato further states:

"In the case of starch, it is also desirable to utilize a cationic material capable of causing the starch to adhere to the added fibers. The polyethyleneimines (e.g. CHEMICAT P-145 by Chemirad Corporation) have been found particularly useful for this purpose, but other cationic organic polyelectrolytes or polymers may also be used, including polyamide-polyamine resins (e.g. KYMENE 557H by Hercules, Incorporated), urea-formaldehyde resins (e.g. PAREX 615 by American Cyanamid Co.), melamine-formaldehyde resins (e.g. PAREX 607 by American Cyanamid Co.), and polyacrylamides (e.g. SEPARAN CP7 by Dow Chemical Co.)." (Col. 3, lines 23-35.)

It should be noted that Brucato is completely silent with respect to using a cationic polyquaternary amine additive.

Amended Independent Claims 1, 9, and 26 Are Not Anticipated by Brucato

Since Brucato does not describe using a cationic polyquaternary amine additive, amended independent Claims 1, 9, and 26, which now recite using a defined cationic polyquaternary amine additive, are not anticipated by Brucato. Likewise the narrower dependent claims that are dependent on amended independent Claims 1, 9, and 26 are not anticipated by Brucato. Accordingly, applicants respectfully request withdrawal of this § 102(b) rejection based on Brucato.

Amended Independent Claims 1, 9, and 26 Would Not Have Been Obvious in View of Brucato

The cationic materials taught by Brucato, such as polyethyleneimines (see above), would not suggest to one of ordinary skill in the art the use of the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, and 26. Likewise the narrower dependent claims that are dependent on amended independent Claims 1, 9, and 26 would not have been obvious in view of Brucato. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Brucato.

The Teachings of Pruszynski (U.S. Patent No. 5,942,087)

Pruszynski teaches a process for manufacturing paper and paperboard that includes the steps of preflocculating granular starch with an aqueous solution containing cellulosic fibers and a flocculant and then introducing the preflocculated mixture to either the white water, thick stock, or thin stock. By preflocculating the starch in the presence of cellulosic fibers, Pruszynski describes achieving improved formation without compromising retention of the starch in the formed mat.

It is instructive to note the reference's discussion of the distinction between coagulants and flocculants. Pruszynski states:

"Coagulants are low molecular weight cationic synthetic polymers or cationic starches that are added to the stock. Coagulants generally reduce the negative surface charges present on granular starch particles and other particles in the stock and accomplish a degree of agglomeration of these particles.

Flocculants, on the other hand, are generally high molecular weight synthetic polymers operating via a bridging mechanism which creates larger agglomerates. The resulting agglomerates are then more easily entrapped in the formed web and therefore retention is improved." (Column 1, lines 52-62.)

Thus, it is clear that Pruszynski teaches the use of flocculants, which are high molecular weight synthetic polymers that operate via a bridging mechanism that create large agglomerates of flocculated starch particles.

It should be noted that Pruszynski is completely silent with respect to using a cationic polyquaternary amine additive.

Amended Independent Claims 1, 9, and 26 Are Not Anticipated by Pruszynski

As mentioned earlier, applicants previously submitted the Inventor's Declaration Pursuant To 37 CFR 1.132 by Sherry L. Thomson dated May 20, 2002 (copy attached) that demonstrates the different results obtained between using the flocculants of Example 3 of Pruszynski and the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, and 26.

Since Pruszynski does not describe using a cationic polyquaternary amine additive, amended independent Claims 1, 9, and 26 are not anticipated by Pruszynski. Likewise the narrower dependent claims that are dependent on amended independent Claims 1, 9, and 26 are not anticipated by Pruszynski. Accordingly, applicants respectfully request withdrawal of this § 102(b) rejection based on Pruszynski.

Amended Independent Claims 1, 9, and 26 Would Not Have Been Obvious in View of Pruszynski

The cationic materials taught by Pruszynski are flocculants (see above), which are high molecular weight synthetic polymers operating via a bridging mechanism which create even larger agglomerates. Applicants previously submitted the Inventor's Declaration Pursuant To 37 CFR 1.132 by Sherry L. Thomson dated May 20, 2002 (copy attached) that demonstrates the differences between the flocculants of Example 3 of Pruszynski and the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, and 26.

Pruszynski's flocculants would not suggest to one of ordinary skill in the art the use of the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, and 26. Likewise the narrower dependent claims that are dependent on amended

independent Claims 1, 9, and 26 would not have been obvious in view of Pruszyński. Accordingly, applicants respectfully request withdrawal of the § 103(a) rejection based on Pruszyński.

The Teachings of Greenwood (U.S. Patent No. 6,238,520)

Greenwood teaches systems consisting of three mandatory components: (1) undissolved starch particles; (b) a cationic polymeric flocculant; and (c) an anionic microparticulate network agglomeration aid (such as bentonite). The flocculant and the agglomeration aid interact to give "network flocculation" in which the starch particles are "trapped."

Greenwood describes these three-component systems as follows:

"Also combined with the undissolved starch particles is an anionic microparticulate network agglomeration aid. This material may be any anionic microparticulate material which is flocculated by the cationic polymeric flocculant. It is normally provided as an aqueous suspension. The flocculant and agglomeration aid together give network flocculation within which the undissolved starch particles are trapped. We believe this is the mechanism which occurs in the invention, rather than flocculation or agglomeration of the starch particles themselves by either of the materials added to the slurry.

Suitable network agglomeration aids include any of the anionic microparticulate materials known for use as anionic bridging coagulant in the process, for instance bentonite and the microparticulate polymers described in WO96/16223, for instance copolymers of 50 to 75 wt % ethyl acrylate and 25 to 50 wt % methacrylic acid. A preferred network agglomeration aid is bentonite.

When bentonite is used as the network agglomeration aid it is normally in the activated form which is generally used when bentonite is used in a retention system. That is, it is normally activated in conventional manner, so as to replace some of the calcium, magnesium or other polyvalent metal ions which are exposed, with sodium, potassium or other appropriate ions.

It is preferred, for improved convenience and efficiency, that the network agglomeration aid is the same material as the bridging coagulant (when used). This is beneficial, as again no new materials are required which are not already available for use in the paper making process.

The cationic polymeric flocculant and the network agglomeration aid may each be made up of more than one material provided separately or as a mixture. Preferably however each of these is provided as a single material.

The three materials which must be present in the coagulated slurry may be combined in any order. Each is preferably supplied in aqueous form (solution or slurry) but can be supplied dry, eg the starch can be used as dry particles, although it is preferably a slurry in water. Preferably the flocculant and agglomeration aid are each added to a slurry of starch in water, but it is also possible to add a starch slurry to a solution of the flocculant or a suspension of the microparticulate agglomeration aid. Preferably a slurry of undissolved starch particles in water is provided, to which an aqueous suspension of anionic microparticulate network agglomeration aid is added, before or after the cationic polymeric flocculant. We find that with certain systems better results are obtained with one particular order of addition. In particular, we find that where the network agglomeration aid is bentonite it can be preferred in some systems to add this to the starch slurry before addition of the cationic polymeric flocculant. In others however it is preferred to add the cationic polymeric flocculant to the starch slurry and subsequently to add the bentonite." (Col. 6, lines 1-57.) (Emphasis added.)

Applicants wish to emphasize that Greenwood does not teach or suggest a starch particle having a cationic polyquaternary amine additive adhered to the starch particle to make a starch particle having a positive surface charge. As plainly stated above by Greenwood, the reference teaches that "[t]he flocculant and agglomeration aid together give network flocculation within which the undissolved starch particles are trapped."

Amended Independent Claims 1, 9, and 26 are Not Anticipated by Greenwood

Since Greenwood does not describe a starch particle having a cationic polyquaternary amine additive adhered to the starch particle to make a starch particle having a stable positive surface charge, amended independent Claims 1, 9, and 26 are not anticipated by Greenwood. Likewise the narrower dependent claims that are dependent on amended independent Claims 1, 9, and 26 are not anticipated by Greenwood. Accordingly, applicants respectfully request withdrawal of this §102(b) rejection based on Greenwood.

Amended Independent Claims 1, 9, and 26 Would Not Have Been Obvious in View of Greenwood

Greenwood teaches that "[t]he flocculant and agglomeration aid together give network flocculation within which the undissolved starch particles are trapped." (Col. 6, lines 5-7.) This entrainment mechanism of Greenwood does not suggest a starch particle having a cationic polyquaternary amine additive adhered to the starch particle to make a starch particle having a stable positive surface charge as now recited in amended independent Claims 1, 9, and 26. Likewise the narrower dependent claims that are dependent on amended independent Claims 1, 9, and 26 would not be obvious in view of Greenwood. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Greenwood.

The Rejection of Claims 3, 4, 11, and 28

Claims 3, 4, 11, and 28 were rejected under 35 U.S.C. § 102(b) as anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over Pruszyński (U.S. Patent No. 5,942,087). The limitations of dependent Claim 3 and 4 have been incorporated in amended independent Claim 1. The limitation of dependent Claim 11 has been incorporated in amended independent Claim 9. The limitation of dependent Claim 28 has been incorporated in amended independent Claim 26. Dependent Claims 3, 4, 11, and 28 have been canceled. Thus, this rejection is tantamount to a rejection of amended Claims 1, 9, and 26. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Pruszyński (U.S. Patent No. 5,942,087)

The teachings of Pruszyński are explained above. Those remarks are incorporated herein by reference.

Amended Claims 1, 9, and 26 are Not Anticipated by Pruszynski

The reasons why amended Claims 1, 9, and 26 are not anticipated by the teachings of Pruszynski are explained above. Those remarks are incorporated herein by reference. Accordingly, applicants respectfully request withdrawal of this §102(b) rejection based on Pruszynski.

Amended Claims 1, 9, and 26 Would Not Have Been Obvious in View of Pruszynski

The reasons why amended Claims 1, 9, and 26 would not have been obvious in view of the teachings of Pruszynski are explained above. Those remarks are incorporated herein by reference. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Pruszynski.

The Rejection of Claims 3-7, 11-25, and 28-34

Claims 3-7, 11-25, and 28-34 were rejected under 35 U.S.C. § 102(c) as anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as obvious over Greenwood (U.S. Patent No. 6,238,520). Claims 3-4, 11-12, and 28 have been canceled. Thus, rejected Claims 5-7, 13-25 and 29-34 are presently pending. Claims 5-7 are dependent on amended independent Claim 1. Claims 13-25 are dependent on amended independent Claim 9. Claims 29-34 are dependent on amended independent Claim 26. Thus, this rejection is tantamount to a rejection of amended independent Claims 1, 9, and 26. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Greenwood (U.S. Patent No. 6,238,520)

The teachings of Greenwood (U.S. Patent No. 6,238,520) are explained above. Those remarks are incorporated herein by reference.

Amended Independent Claims 1, 9, and 26 are Not Anticipated by Greenwood

The reasons why amended Claims 1, 9, and 26 are not anticipated by the teachings of Greenwood are explained above. Those remarks are incorporated herein by reference. Accordingly, applicants respectfully request withdrawal of this §102(e) rejection based on Greenwood.

Amended Independent Claims 1, 9, and 26 Would Not Have Been Obvious in View of Greenwood

The reasons why amended Claims 1, 9, and 26 would not have been obvious in view of the teachings of Greenwood are explained above. Those remarks are incorporated herein by reference. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Greenwood.

The Rejection of Claims 56 and 57

Method Claims 56 and 57 were rejected under 35 U.S.C. § 103(a) as obvious in view of Greenwood and Casey (Casey, J. (ed.), *Pulp and Paper, Chemistry and Chemical Technology*, 3d ed., Vol. III, p. 1494 (1981)). Independent Claims 56 and 57 have been amended to incorporate the limitations recited in dependent Claims 2-4, thus Claims 56 and 57 have been amended in the same way as Claim 1. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Greenwood (U.S. Patent No. 6,238,520)

The teachings of Greenwood (U.S. Patent No. 6,238,520) are explained above. Those remarks are incorporated herein by reference.

The Teachings of Casey

Casey teaches that "quaternary amines remain positively charged under neutral or alkaline conditions."

Amended Method Claim 56 and 57 Would Not Have Been Obvious in View of Greenwood and Casey

Amended Claims 56 and 57 would not have been obvious in view of Greenwood and Casey because Greenwood teaches that "[t]he flocculant and agglomeration aid together give network flocculation within which the undissolved starch particles are trapped." (Col. 6, lines 5-7.) This entrapment mechanism of Greenwood does not suggest the method for forming a starch particle having a stable positive surface charge as now recited in amended Claims 56 and 57.

The teaching of Casey that quaternary amines remain positively charged under neutral or alkaline conditions does nothing to cure the deficiencies of Greenwood.

Therefore, amended method Claims 56 and 57 would not have been obvious in view of Greenwood combined with Casey. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Greenwood and Casey.

The Rejection of Claims 58-69

Method Claims 58-69 were rejected under 35 U.S.C. §103(a) as being unpatentable in view of Greenwood (U.S. Patent No. 6,238,520). Independent Claim 58 has been amended to incorporate the limitations recited in dependent Claims 59-60, which have been canceled. Thus, rejected Claims 58 and 61-69 are presently pending. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Greenwood (U.S. Patent No. 6,238,520)

The teachings of Greenwood (U.S. Patent No. 6,238,520) are explained above. Those remarks are incorporated herein by reference.

Amended Independent Claim 58 Would Not Have Been Obvious in View of Greenwood

Amended Claim 58 would not have been obvious in view of Greenwood because Greenwood teaches that "[t]he flocculant and agglomeration aid together give network

flocculation within which the undissolved starch particles are trapped." (Col. 6, lines 5-7.) This entrapment mechanism of Greenwood does not suggest the method for forming a starch particle having a stable positive surface charge as now recited in paragraph (b) of amended Claim 56. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Greenwood.

The Rejection of Claims 3-7, 11-25, 28-34, 58, 59, 61-63, 68, and 69

Claims 3-7, 11-25, 28-34, 58, 59, 61-63, 68, and 69 were rejected under 35 U.S.C. § 103(a) as being unpatentable in view of Brucato (U.S. Patent No. 4,609,432). Independent Claim 1 has been amended to incorporate the limitations recited in dependent Claims 3-4, which have been canceled. Independent Claim 9 has been amended to incorporate the limitations recited in dependent Claims 11-12, which have been canceled. Independent Claim 26 has been amended to incorporate the limitations recited in dependent Claims 28-29, which have been canceled. Independent Claim 58 has been amended to incorporate the limitations recited in dependent Claims 59-60, which have been canceled. Thus, this rejection applies to pending Claims 1, 9, 13-26, 30-35, 58, and 64-69. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Brucato (U.S. Patent No. 4, 609,432)

The teachings of Brucato (U.S. Patent No. 4, 609,432) are explained above. Those remarks are incorporated herein by reference.

Claims 1, 5-7, 9, 12-26, 29-35, 58, and 61-69 Would Not Have Been Obvious in View of Brucato

The cationic materials taught by Brucato, such as polyethyleneimines (see above discussion), would not suggest to one of ordinary skill in the art the use of the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, 26, and 58.

Therefore, narrower dependent Claims 12-25 (that are dependent on amended independent Claim 9), narrower dependent Claims 29-35 (that are dependent on amended independent Claim 26), and narrower dependent Claims 61-69 (that are dependent upon amended independent Claim 58) would not have been obvious in view of Brucato. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Brucato.

The Rejection of Claims 56 and 57

Claims 56 and 57 were rejected under 35 U.S.C. § 103(a) as being unpatentable in view of Brucato combined with Casey. Independent Claims 56 and 57 have been amended to incorporate the limitations recited in dependent Claims 2-4, thus Claim 56 has been amended in the same way as Claim 1. Applicants respectfully request reconsideration and withdrawal of this rejection for the following reasons.

The Teachings of Brucato (U.S. Patent No. 4, 609,432)

The teachings of Brucato (U.S. Patent No. 4, 609,432) are explained above. Those remarks are incorporated herein by reference.

The Teaching of Casey

The teaching of Casey is explained above. Those remarks are incorporated herein by reference.

Amended Claims 56 and 57 Would Not Have Been Obvious in View of Brucato and Casey

Amended Claims 56 and 57 would not have been obvious in view of Brucato and Casey because the cationic materials taught by Brucato, such as polyethyleneimines (see above discussion), would not suggest to one of ordinary skill in the art the use of the defined cationic polyquaternary amine additive as now recited in amended independent Claims 56 and 57.

The teaching of Casey that quaternary amines remain positively charged under neutral or alkaline conditions does nothing to cure the deficiencies of Brucato.

Therefore, amended independent Claim 56 would not have been obvious in view of Brucato combined with Casey. Accordingly, applicants respectfully request withdrawal of this §103(a) rejection based on Brucato and Casey.

The Examiner's Comments on Applicants' Arguments

In response to the Examiner's comments, applicants respectfully submit that the amended claims (amended independent Claims 1, 9, 26, 56, 57, and 58) are now commensurate in scope with the showing of unexpected results contained in the Inventor's Declaration Pursuant To 37 CFR 1.132 by Sherry L. Thomson dated May 20, 2002 (copy attached) that demonstrated the different results obtained between using the flocculants of Example 3 of Pruszynski and using the defined cationic polyquaternary amine additive as now recited in amended independent Claims 1, 9, 26, 56, 57, and 58.

The Examiner further stated that there has been no comparison made with respect to the teachings of Brucato and Greenwood. Applicants respectfully submit that the teachings of Brucato and Greenwood do not establish a prima facie case of obviousness (as explained above) with respect to the starch particle and a cationic polyquaternary amine additive adhered to the starch particle, thereby making a starch particle having a stable positive surface charge, as now recited in amended independent Claims 1, 9, 26, 56, 57, and 58. Therefore, the time and expense of a showing of unexpected results with respect to the teachings of Brucato and Greenwood should not be required.

CONCLUSION

In view of the above discussion, applicants believe that the pending claims (Claims 1, 5-9, 12-26, 29-35, 56-58, and 61-69) are in condition for allowance, and applicants respectfully request reconsideration and allowance of these claims. If any issues remain that may be

expeditiously addressed in a telephone interview, the Examiner is encouraged to telephone applicants' undersigned attorney at 206.695.1707.

Respectfully submitted,

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Attached: Photocopy of Inventor's Declaration
Pursuant To 37 CFR 1.132 by
Sherry L. Thomson dated May 20, 2002

I hereby certify that this correspondence is being transmitted via facsimile to the U.S. Patent and Trademark Office, Group Art Unit 1731, Examiner Peter Chin, at facsimile number 1-703-305-7718 on April 16, 2003.

Date:

April 16, 2003

Yvette L. Chussader

PC:gjm